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# Bank of Canada Monthly Research Update

March 2016

This monthly newsletter features the latest research publications by Bank of Canada economists. The report includes papers appearing in external publications and staff working papers published on the Bank of Canada's website.

# PUBLISHED PAPERS

## In Press

Friedrich, Christian, "Global inflation dynamics in the post-crisis period: What explains the puzzles?", Economic Letters, Volume 142, May 2016, Pages 31-34

Lin, Zhenguo, Yingchun Liu, & Jia Xie, "Immigrants and Mortgage Delinquency", Real Estate Economics, Volume 44, Issue 1, Spring 2016, Pages 198-235

## Forthcoming

Ahnert, Toni, "Rollover Risk, Liquidity and Macroprudential Regulation", Journal of Money, Credit and Banking

Cateau, Gino, "Price Level versus Inflation Targeting under Model Uncertainty", Canadian Journal of Economics

# STAFF WORKING PAPERS

Allen, Jason, & James R. Thompson, "Capital Structure, Pay Structure and Job Termination", Bank of Canada Staff Working Paper 2016-12

Cosma, Mihai, Tomo Nakashima & Boran Plong, "A Framework in Search of an Optimal Margining Policy for Official Institutions: The Canadian Experience", Bank of Canada Staff Discussion Paper 2016-09

Duprey, Thibaut, Benjamin Klaus, & Tuomas Peltonen, "Dating Systemic Financial Stress Episodes in the EU Countries", Bank of Canada Staff Working Paper 2016-11

Friedrich, Christian & Pierre Guérin, "The Dynamics of Capital Flow Episodes", Bank of Canada Staff Working Paper 2016-09

Garriott, Corey, & Kyle Gray, "Canadian Repo Market Ecology", Bank of Canada Staff Discussion Paper 2016-08

Hajzler, Christopher, & Jonathan Rosborough, "Government Corruption and Foreign Direct Investment Under the Threat of Expropriation", Bank of Canada Staff Working Paper 2016-13

Kruger, Mark, Kun Mo, & Benjamin Sawatzky, "The Evolution of the Chinese Housing Market and Its Impact on Base Metal Prices", Bank of Canada Staff Discussion Paper 2016-07

Li, Fuchun & Héctor Pérez Saiz, "Measuring Systemic Risk Across Financial Market Infrastructures", Bank of Canada Staff Working Paper 2016-10

Weber, Warren E., " A Bitcoin Standard: Lessons from the Gold Standard", Bank of Canada Staff Working Paper 2016-14

Welte, Angelika, "Wait a Minute: The Efficacy of Discounting versus Non-Pecuniary Payment Steering", Bank of Canada Staff Working Paper 2016-08

## ABSTRACTS

### *Global Inflation Dynamics in the Post-Crisis Period: What Explains the Puzzles?*

Using a factor model, I estimate a global Phillips curve for 25 advanced countries over 1995Q1-2013Q3. I find that the inclusion of household inflation expectations in the Phillips curve helps to explain puzzling global inflation dynamics during the post-crisis period.

### *Immigrants and Mortgage Delinquency*

This article studies the effect of immigrant status on mortgage delinquency. Due to their different social and economic background, immigrant households may not integrate well into the host society, and therefore are more likely to be delinquent on mortgages than otherwise identical native-born households. We test this hypothesis by comparing the mortgage delinquency rate between immigrant and native-born households in the 2009 PSID (Panel Study of Income Dynamics) data, in which all the immigrant households have been in the United States for more than 10 years. We find that, after controlling for observables, those relatively recent immigrants who have been in the United States for 10 to 20 years have a higher mortgage delinquency rate than native-born, while immigrants who have resided in the United States for more than 20 years are no different from native-borns. In addition, there is no evidence that the second generation of immigrants is more likely to be delinquent than the third-or-higher generations. Our results are robust to potential sample-selection bias and functional misspecifications.

## *Rollover Risk, Liquidity and Macroprudential Regulation*

I study rollover risk in wholesale funding markets when intermediaries hold liquidity ex ante and fire sales may occur ex post. Multiple equilibria exist in a global rollover game: intermediate liquidity holdings support equilibria with both positive and zero expected liquidation. A simple uniqueness refinement pins down the private liquidity choice, which balances the forgone expected return on investment with reduced fragility and costly liquidation. Due to fire sales, liquidity holdings are strategic substitutes. Intermediaries free ride on the holdings of other intermediaries, causing excessive liquidation. To internalize the systemic nature of liquidity, a macroprudential authority imposes liquidity buffers.

## *Price Level versus Inflation Targeting under Model Uncertainty*

It has recently been suggested that price-level targeting (PLT) may be a superior approach to monetary policy than inflation targeting (IT) due to its ability to automatically influence private sector expectations to stabilize the economy. In this paper, I analyze whether PLT dominates IT if the ability of the central bank to influence expectations is limited by model uncertainty. Specifically, I analyze how the characterization and performance of PLT and IT rules are impacted if private agents form expectations according to a model that deviates from the policy-maker’s reference model. Using robust control to derive robust rules in such a situation, I find that the performance of PLT rules deteriorate faster than that of IT rules as the degree of misspecification increases. Nevertheless, the absolute decline in performance of the PLT rules is relatively small across alternative models that are statistically plausible.

## *Capital Structure, Pay Structure and Job Termination*

We develop a model to analyze the link between financial leverage, worker pay structure and the risk of job termination. Contrary to the conventional view, we show that even in the absence of any agency problem among workers, variable pay can be optimal despite workers being risk averse and firms risk neutral. We find that firms employing workers with safer projects (and lower probability of job termination) use more variable compensation, and that leverage is strictly increasing in the amount of variable pay. These two results lead to the main insight of the paper: the more likely it is that a worker is terminated, the lower a firm’s leverage. We provide empirical support for these predictions with a novel data set of all Canadian financial brokers and dealers. In the context of our empirical analysis, the model provides a novel mechanism to help explain why high leverage and high amounts of variable pay may be pervasive in financial relative to non-financial institutions.

### *A Framework in Search of an Optimal Margining Policy for Official Institutions: The Canadian Experience*

One of the main outcomes of the global financial crisis has been a series of new regulations imposed on the financial system and specifically on banks. As a result of the changing regulations, bank dealers introduced various “credit” and “liquidity” charges for uncollateralized over-the-counter (OTC) derivatives trades, governed by a one-way or asymmetric credit support annex (CSA), whereby only bank dealers are required to post collateral in favour of official institutions—sovereigns, central banks, government agencies, sovereign wealth funds and supranational institutions—such as the Government of Canada. These charges have sharply increased costs for the government, which, like other official institutions, has been an extensive user of OTC derivatives. In this paper, we propose a framework that official institutions can use to analyze the cost and risk trade-offs among potential margining policies, including moving to a more symmetric CSA versus the prevailing one-way CSAs. Our analysis indicates that, in the case of Canada, moving to a more symmetric CSA results in lower cost and risk for the government relative to the prevailing one-way CSA margining policy, due to the government’s relatively lower funding cost. In fact, all margining policies tested dominate the prevailing one-way CSA prior to 2015. As a result, remaining under the one-way CSA and continuing to transact OTC derivatives is no longer the best policy given the charges levied against the government.

### *Dating Systemic Financial Stress Episodes in the EU Countries*

This paper introduces a new methodology to date systemic financial stress events in a transparent, objective and reproducible way. The financial cycle is captured by a monthly country-specific financial stress index. Based on a Markov-switching model, high financial stress regimes are identified, and a simple algorithm is used to select those episodes of financial stress that are associated with a substantial negative impact on the real economy. By applying this framework to 27 European Union countries, the paper is a first attempt to provide a chronology of systemic financial stress episodes in addition to the expert-detected events that are currently available.

## *The Dynamics of Capital Flow Episodes*

This paper proposes a novel methodology for identifying episodes of strong capital flows based on a regime-switching model. In comparison with the existing literature, a key advantage of our methodology is to estimate capital flow regimes without the need for context- and sample-specific assumptions. We implement this approach using weekly fund flows data for a large set of advanced and emerging economies. As an application of our methodology to the global financial cycle literature, we use a time-varying structural vector-autoregressive (VAR) model to assess the impact of U.S. stock market volatility (VIX) shocks and U.S. monetary policy shocks on aggregated measures of equity outflow and equity inflow episodes. Our results indicate that both VIX and U.S. monetary policy shocks had substantially time-varying effects on episodes of strong capital flows over our sample period.

## *Canadian Repo Market Ecology*

This is the first of the Financial Markets Department's descriptions of Canadian financial industrial organization. The document discusses the organization of the repurchase-agreement (repo) market in Canada. We define the repo contract, the market infrastructures that support repo trading and the composition of the market participants. We also describe repo trading practices in Canada, risks in the repo market and repo regulation. A repo is a financial contract that resembles a collateralized loan. It is used to support the funding needs of financial institutions and to procure on a temporary basis specific securities. The Canadian repo market is primarily composed of large banks and large investment institutions such as pension funds. A unique feature of the Canadian market is that Canadian investment institutions are net borrowers of cash via repo. Repo can transmit risks in the financial system because it can create levered interconnections among participants. Risks in the Canadian repo market are relatively smaller than in other jurisdictions.

## *Government Corruption and Foreign Direct Investment Under the Threat of Expropriation*

Foreign investment is often constrained by two forms of political risk: expropriation and corruption. We examine the role of government corruption in foreign direct investment (FDI) when contracts are not fully transparent and investors face the threat of expropriation. Using a novel dataset on worldwide expropriations of FDI over the 1990–2014 period, we find a positive relationship between the extent of foreign investor protections and the likelihood of expropriation when a country's government is perceived to be highly corrupt, but not otherwise. We then develop a theory of dynamic FDI contracts under imperfect enforcement and contract opacity in which expropriation is a result of illicit deals made with previous governments. In the model, a host-country government manages the FDI contract on behalf of the public, which does not directly observe government type (honest or corrupt). A corrupt type is able to extract rents by encouraging hidden investments in return for bribes. Opportunities for corrupt deals arise from the distortions in the optimal contract when the threat of expropriation is binding. Moreover, a higher likelihood of the government being corrupt increases the public's temptation to expropriate FDI, magnifying investor risk. The model predicts that expropriation is more likely to occur when the share of government take is low and following allegations of bribes to public officials, and it suggests an alternative channel through which corruption reduces optimal foreign capital flows.

## *The Evolution of the Chinese Housing Market and Its Impact on Base Metal Prices*

The Chinese housing market has grown rapidly following its liberalization in the 1990s, generating significant economic activity and demand for base metals. In this paper, we discuss the evolution of the Chinese housing market and quantify its importance for the overall Chinese economy and its linkages to base metal prices. We estimate that the housing boom was responsible for roughly a quarter of the 85 per cent increase in base metal prices from 2002 to 2010. Since 2014, however, a substantial inventory overhang has led to a steep correction in the housing market, which in turn has contributed up to a third of the 25 per cent decline in base metal prices. While the drag on metal prices should ease as the Chinese housing market stabilizes, the level of support from this sector will likely remain minimal compared with the experience of the past decade.

## *Measuring Systemic Risk Across Financial Market Infrastructures*

We measure systemic risk in the network of financial market infrastructures (FMIs) as the probability that two or more FMIs have a large credit risk exposure to the same FMI participant. We construct indicators of credit risk exposures in three main Canadian FMIs during the period 2007–11 and use extreme value methods to estimate this probability. We find large differences in the contribution to systemic risk across participants. We also find that when participants are in financial distress, they tend to create large credit exposures in two or more FMIs. Our results suggest that an appropriate oversight of FMIs may benefit from an in-depth system-wide analysis, which may have useful implications for the macroprudential regulation of the financial system.

### *A Bitcoin Standard: Lessons from the Gold Standard*

This paper imagines a world in which countries are on the Bitcoin standard, a monetary system in which all media of exchange are Bitcoin or are backed by it. The paper explores the similarities and differences between the Bitcoin standard and the gold standard and describes the media of exchange that would exist under the Bitcoin standard. Because the Bitcoin standard would closely resemble the gold standard, the paper explores the lessons about how it would perform by examining the classical gold standard period, specifically 1880–1913. The paper argues that because there would be virtually no arbitrage costs for international transactions, countries could not follow independent interest rate policies under the Bitcoin standard. However, central banks would still have some limited ability to act as lenders of last resort. Based on the experience during the classical gold standard period, the paper conjectures that there would be mild deflation and constant exchange rates under the Bitcoin standard. The paper also conjectures how long the Bitcoin standard might last if it were to come into existence.

### *Wait a Minute: The Efficacy of Discounting versus Non-Pecuniary Payment Steering*

Merchants who accept credit cards face payment processing fees. In most countries, the no-surcharge rule prohibits them from using surcharges to pass these fees on to customers. However, merchants are allowed to steer consumers toward less costly payment methods by offering discounts or using non-pecuniary incentives such as convenience and speed. Drawing upon micro data from a survey of Canadian households, I estimate a discrete choice model of consumers’ payment methods to establish merchant costs for both of these strategies. I find that, while discounts are unprofitable because they subsidize a large portion of consumers who are already using cash and debit cards, non-pecuniary steering can be an effective strategy for transactions above $25.